

OOI Reference Manual 2: Comparative Physics of the EGSC Model

Purpose: To position the EGSC model relative to existing theories in fundamental physics, highlighting key similarities and divergences to provide context for researchers.

1. Relationship to Causal Set Theory (CST)

- **Similarity:** The EGSC model adopts the foundational premise of CST: a discrete, causally ordered set of events as the substrate of spacetime.
- **Divergence:** The EGSC model proposes a *specific, information-theoretic action principle* ($S[C]$) as the engine of cosmic evolution. The inclusion of the von Neumann entropy term ($\gamma \Sigma_E$) is a novel contribution designed to dynamically solve the "continuum problem" by ensuring that information-rich, manifold-like histories are overwhelmingly favored.

2. Relationship to the Many-Worlds Interpretation (MWI)

- **Similarity:** Like MWI, the EGSC model takes the universal state vector seriously and has no ad-hoc "collapse" postulate. All possible outcomes exist in some form.
- **Divergence (The "Inductive Many-Histories" Interpretation):** The EGSC model distinguishes between the **informationally real** and the **causally constructed**. The "many worlds" exist as potential computational paths in the universe's latent space, but only *one* history is selected by the action principle to become the single, constructed present. This avoids the ontological baggage of physically real, parallel universes while preserving the computational power of the multiverse concept.

3. Relationship to Bohmian Mechanics

- **Similarity:** Both theories are fundamentally deterministic, non-local, and propose an underlying reality that guides the behavior of particles.
- **Divergence:** The EGSC model provides a more fundamental explanation. The Bohmian "Quantum Potential" is reinterpreted as a powerful **emergent, effective description** of the "force" exerted by the EGSC's Stationary Action Principle. The EGSC model also explains the origin of the Born Rule distribution (the "quantum equilibrium") as the natural, stable result of a universe that has been computationally evolving for billions of years, whereas Bohmian mechanics must postulate it.

4. Relationship to Objective Collapse Theories (e.g., GRW)

- **Similarity:** Both theories posit that the transition from quantum superposition to classical reality is an objective, observer-independent process.
- **Divergence:** GRW proposes a fundamentally **stochastic (random) physical collapse** ("flash"). The EGSC model proposes a **computationally determined selection event**. The "collapse" is not random; it is the single outcome selected by the non-local,

history-dependent action principle as the most informationally fit. This qualifies the EGSC as a form of **superdeterminism**.

5. Relationship to QBism (Quantum Bayesianism)

- **Similarity:** The EGSC model supports the QBist view that an agent's "wave function" is an epistemic tool—a subjective, Bayesian belief map for predicting the outcomes of their interactions with the world.
- **Divergence:** QBism is often silent on the nature of the objective reality that gives rise to the agent's experience. The EGSC model provides this missing piece: it describes the **objective, computational reality** that the QBist agent is an emergent configuration *within*. QBism is the necessary "user's guide" for any rational agent navigating the outputs of the EGSC's deterministic, but inaccessible, computation.